

CWIP

**Role of Grease and Sand Traps in
the Operation and Maintenance of
Sewerage Systems**

Coastal Water Quality Improvement Project

USAID Contract No. 532-C-00-98-00777-00

ROLE OF GREASE AND SAND TRAPS IN THE OPERATION AND MAINTENANCE OF SEWERAGE SYSTEMS

July 15, 2001
Revised October 2001

Prepared for the:

Government of Jamaica's
National Environment and Planning Agency

And the

United States Agency for International Development

Implemented by:

Associates in Rural Development, Inc.
P.O. Box 1397
Burlington, Vermont 05402

PREFACE

The Coastal Water Quality Improvement Project (CWIP) is a five-year bilateral initiative between the Government of Jamaica's National Environment and Planning Agency (NEPA) and the United States Government, through the Agency for International Development (USAID). Five distinct, but interrelated, activities associated with coastal water quality improvement are being carried out to form a synergy of interventions contributing to the achievement of the USAID Strategic Objective 2 (SO2) – Improved quality of key natural resources in selected areas that are both environmentally and economically significant. CWIP is being implemented by Associates in Rural Development, Inc. (ARD) with assistance from Camp, Dresser & McKee, Inc. (CDM) and the Construction Resource and Development Centre (CRDC).

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INTRODUCTION

Under the auspices of the Coastal Water Quality Project, sponsored by the United States Agency for International Development (USAID), this manual has been developed to assist in disseminating information, considered to be critically important for the satisfactory long term service of NWC's public sewage systems, to existing and potential sewage customers of the National Water Commission in Jamaica.

It is NOT a textbook, it is NOT intended to be a comprehensive engineering guide for either central sewage system design (or operation or maintenance) or property connection design – although it does contain a substantial amount of technical information – presented, hopefully, in an easily readable and understandable format.

It has been prepared as a series of individual sections (each separately identified and paged) and is presented in a loose leaf folder format – so that any combination of individual sections may be combined into a purpose specific manual to serve particular customer needs as they may arise.

The sections seek to answer simple questions and to address specific issues as follows:

What is "sewage" or "wastewater"?

Why do we need to collect and treat sewage?

Who does what in Jamaica?

How do we characterize sewage and industrial wastewater?

Why do we need to limit the things put into our sewers?

Fats, Oils and Greases (FOG) - in discharges

Sand - in discharges

Other Oils and Greases Etc., - in discharges

A short history of sewage collection and treatment

How we collect sewage

Microorganisms and sewage treatment

How can we, and how do we, treat sewage in Jamaica & how do we dispose of the treatment products

Waste Stabilization Ponds – as now provided for Negril and Montego Bay

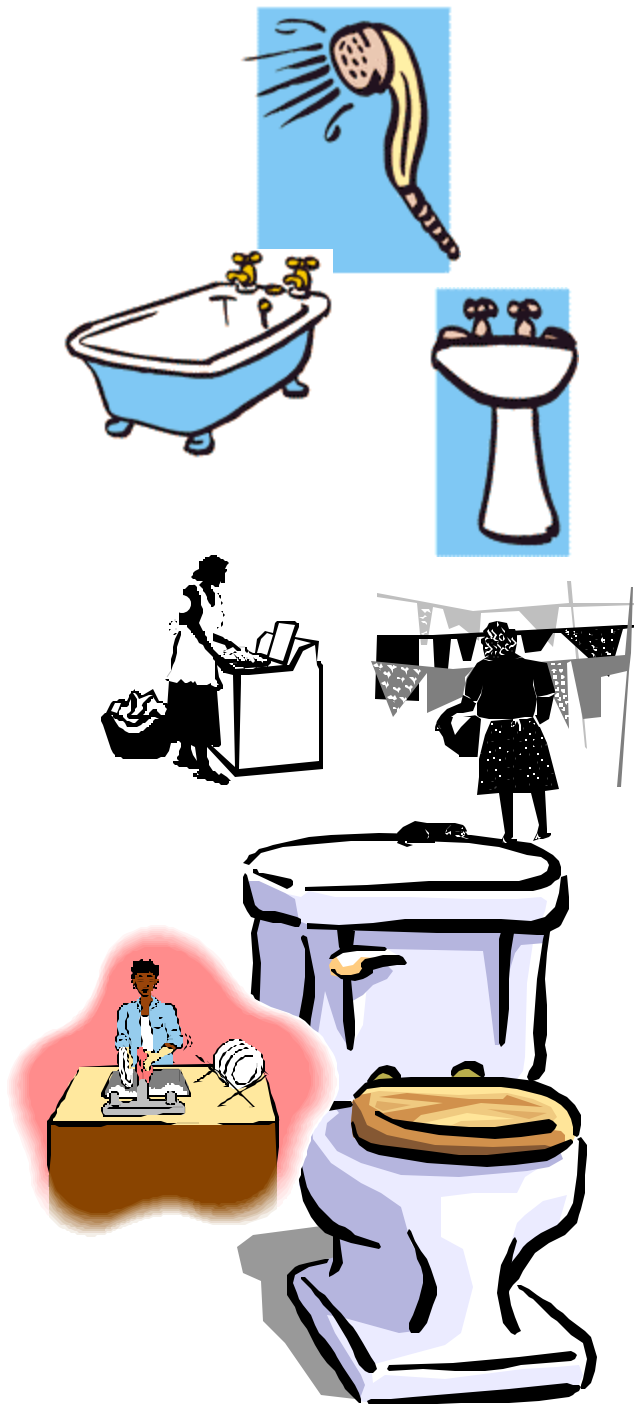
The Oxidation Ditch Sewage Treatment Works – as now provided in Ocho Rios

How to have a property (properly) connected to an NWC sewer

The NWC's "Consent to Discharge"

The purpose of this manual is to explain how the NWC can assist new customers to connect properly and to explain the reasons behind the NWC's rules and regulations for connections – to promote the maximum levels of connections to the new sewage systems in Negril and Ocho Rios and the extension of the Montego Bay system (with new treatment facilities), to promote "best practices" in Customers use of their sewage disposal facilities with particular emphasis on sewage influent quality guidelines and how influent quality impact sewage treatment.

WHAT IS "SEWAGE" AND "WASTEWATER"?



"Sewage" is defined as used household or "domestic" water - and water-carried solids - that is the dirty water that we put down our kitchen sinks, our dirty laundry or face-basin water, our bath or shower water and, of course, the water and waste that we flush down our toilets.

Sewage is primarily organic waste^a (provided that we only flush down our toilets what we are supposed to flush down them and pour down our drains what should be poured down them!).

However it also contains soap and detergent that we use in our bathing and laundry activities and, in the case of kitchen sink water, may contain waste food particles and cooking oils and grease washed from dirty dishes or cooking pots and pans.

Sewage can conveniently be separated into **body wastes** (feces and urine) and **gray water**, which is all the other liquid wastes of the household, including both laundry and kitchen waste water.

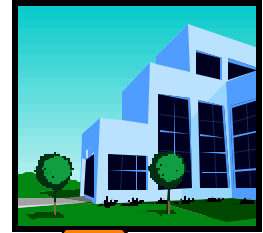
Body wastes (or "black water") are the most hazardous - due to the possibility of contact with intestinal disease organisms.

Gray water ordinarily has few disease organisms unless the laundry has contained garments soiled by body wastes.

^a **Organic** waste is waste material that comes mainly from animal and plant sources. It can generally be consumed by small living organisms. Inorganic wastes are chemical substances of mineral origin. Inorganic wastes, such as sand and salt, for example, are generally either not affected or are only slightly affected by the actions of these same small living organisms.

Organism means a form of plant or animal life. Bacteria and algae are microscopic organisms. Certain bacteria play important roles in virtually all wastewater treatment processes while some algae are important in others.

Because the activities normally associated with **offices, shops, hotels and restaurants** are similar to those that we practice in our individual homes - laundry, washing of cooking pots and utensils, bathing (of workers) and using the toilet – these commercial establishments **generate** water borne wastes very similar in character to (domestic or household) **sewage**.



However the used water from **hotels** and **restaurants** often has

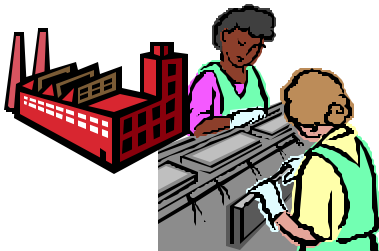
much greater quantities of gray water - because of the large scale of food preparation and cooking activities associated with such properties and because many hotels operate their own laundries.

(As commercial operations, hotel and restaurant wastes may also contain larger quantities of "industrial" cleaners.)



As a result of cooking activities, a particular problem often experienced with sewage (particularly from restaurants and hotels) **is the presence of excessive quantities of fats, oil & grease (FOG)**. FOG results in major operational problems both in the collecting sewers and at treatment facilities. FOG solidifies on the inside of sewers restricting the flow of sewage, similar to the way that cholesterol restricts the flow of blood through arteries and veins. At treatment plants a high level of fats, oils and grease in the sewage inhibits the biological treatment processes used.

"Wastewater" is the used water and water-carried solids originating from all the variety of sources within a community - not only water-borne household or domestic waste (sewage) but also used and contaminated water from industrial facilities and the like – and the definition also includes rain or storm water drainage.



Industrial wastewater may contain concentrated levels of organic waste and/or other types of water-borne waste products - depending on the particular industrial processes involved – and therefore **may have a composition very different from normal sewage**. Some industrial wastewaters can be extremely difficult (and expensive) to treat but some can be satisfactorily "pre-treated" to a similar composition to sewage.

In Jamaica, the **National Water Commission (NWC)** operates **sewage collection and treatment systems** – to serve individual homes (domestic or residential customers) and commercial/ institutional properties that generate used water of a similar character to that produced by "residential"

customers. *The responsibility for treating industrial wastewater rests primarily with the particular industrial organization concerned – but properly and reliably pre-treated industrial wastewater may, at the discretion of and with the approval of the NWC, be discharged into NWC sewers.*

WHY DO WE NEED TO COLLECT AND PROPERLY TREAT SEWAGE?

The improper disposal of any waste makes our communal lives very unpleasant (even our garbage can smell terribly when it is not collected and disposed off promptly) and **can pollute our environment**.

However, as sewage contains urine and feces and urine and feces can contain germs, **the improper disposal of sewage can result in** not only pollution but also **the spread of disease**.

As we have already said, sewage is primarily of "organic" origin i.e. waste that be decomposed by microorganisms (tiny living animals or plants that are so small that they can only be seen under a microscope).

When a **moderate** amount of organic waste is disposed of on or in the soil or in a watercourse or the sea, nature provides a natural purification process.

When moderate amounts of sewage are disposed of on or in the ground, the sewage decays and the soil absorbs the by-products of decomposition - human and animal wastes contain nitrogen which can be broken down by microorganisms in the soil such that the decomposed materials can be used by plants for their growth - in much the same way as plants use the fertilizer that we spread on our fields and crops.

Nature also helps to return our water into a natural state of purity through the actions of other microorganisms that live in our streams, rivers and the sea - provided the quantity of organic waste is reasonably small.

However, if too much waste is disposed of in a single location, we can overload "nature" and problems can arise.

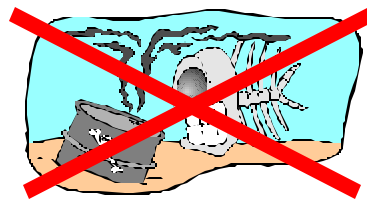
If too much sewage enters the soil, the groundwater that we often use as our drinking water can become polluted.

If too much sewage is discharged into a river or stream the water becomes unsightly in colour, foul smelling and uninhabitable for fish and other aquatic life.

The same degradation can affect our seas, killing the fish and corals and creating major problems for our fishermen and for our tourism industry.

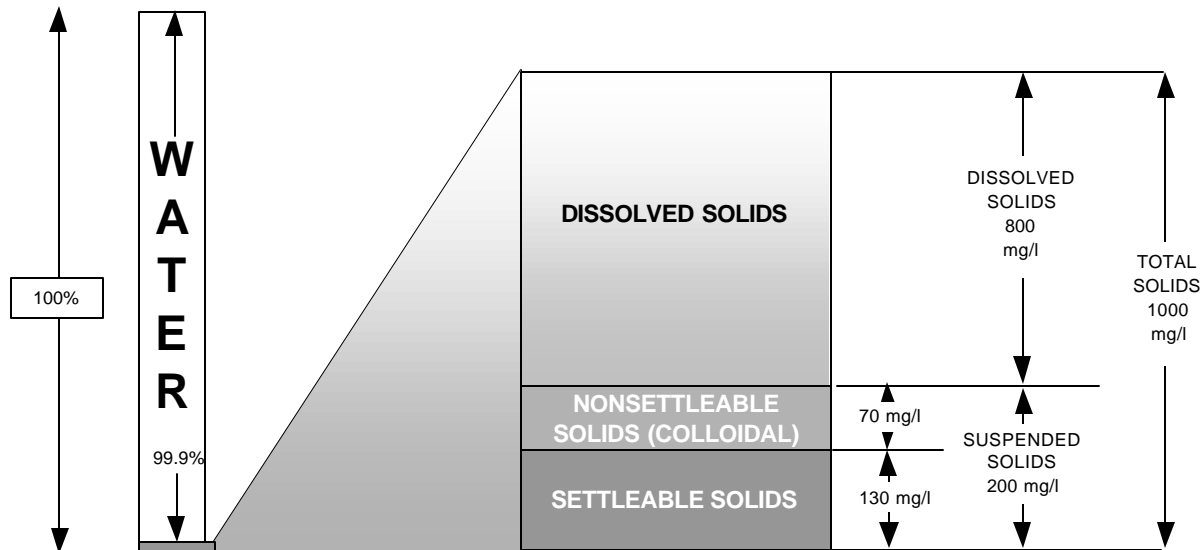
In addition, our commercial and industrial activities can produce large volumes of contaminated wastewater. As this wastewater may contain excessively high amounts of organic material and/or man-made or inorganic pollutants (e.g. heavy metals, complex hydrocarbons and the like - depending on the particular "industrial" processes involved), the improper disposal of this waste can also result in serious damage to our environment (or, at times, even be dangerous to our health).

So, when we live in close proximity to each other in towns and cities, and the volumes of wastewater produced become large, it is vitally important that we collect, treat and dispose of our wastes in a proper and "environmentally friendly" way - otherwise our health can suffer and our local water supplies and our local rivers, streams and the sea can become seriously polluted - a situation that none of us wants!



HOW DO WE CHARACTERIZE SEWAGE & WASTEWATER?

Sewage (domestic or residential wastewater) consists mainly of feces, urine and "dirty" washing (bathing or laundry) water and is approximately 99.9% water and 0.1% solids - with the amount of total solids being approximately 1000 milligrams per litre (mg/l) - as shown in the diagram below.



Of the "solids", most (approximately 80% or 800 mg/l) are dissolved while the remaining 200 mg/l is suspended within the wastewater.

These solids in sewage are about 70% **organic** (mainly proteins, carbohydrates and fats) and about 30% **inorganic** (mainly grit, salts and metals).

The large number of chemical compounds present in sewage makes it impossible to list them all but **we can characterize sewage, and its potential effect on our environment, using certain specific (standard) parameters. The most important are:**

BOD & COD

- Biological and Chemical Oxygen Demand

SS

- Suspended Solids

N

- Nitrogen, as **Ammonia**, NH_3 , or **Nitrate**, NO_3

P

- Phosphorous as **Phosphate**, PO_4

FC

- Fecal Coliform

Of course, "**Toxic** " **Pollutants** are always important as they can be hazardous to the environment (particularly aquatic life) and, indeed, to human life. However, provided that we put down our drains and toilets only those things that should be put down them, **sewage** does not contain significant quantities of toxic pollutants.

The **organic strength of sewage** is normally expressed in terms of the **oxygen demand** exerted by the waste matter during oxidation. **The most commonly used parameters are Biochemical Oxygen Demand (BOD**, where the wastes are biologically oxidized through degradation by bacteria) and **Chemical Oxygen Demand (COD**, where wastes are oxidized chemically). Simply stated BOD is the amount of oxygen used by microorganisms as they biologically decompose organic matter in wastewater. The larger the amount of organics, the greater the amount of oxygen that will be needed by these microorganisms. A BOD load can pose a threat to the aquatic environment by depressing the levels of oxygen dissolved in the water such that fish and other life can be affected. *BOD is usually reported as the amount of oxygen consumed over a specified time period at a specified incubation temperature. A 5day time period at 20° C is frequently used and is reported as BOD₅. Waters with a BOD₅ level of less than 4 mg/l are considered reasonably clean.*

Chemical Oxygen Demand COD is the amount of oxygen required to oxidize the organic matter in water through chemical reactions. A high COD level can affect aquatic life in a similar manner to BOD.

Suspended solids **are the discrete particles present in suspension in water.** The presence of suspended material, such as clay, silt, finely divided organic matter, plankton and other (inorganic) material in water is known as **turbidity**. Turbidities in excess of 5 units can be visually detected in a glass of water and are usually objectionable for aesthetic reasons. High levels of suspended solids can prevent the successful development of fish eggs and larvae and reduce fish growth rates and their resistance to disease.

Nitrates and Phosphates Nitrates (the principal form of combined nitrogen found in natural waters) and Phosphates (a compound of the non-metallic element phosphorous - primarily in the ortho-phosphate form - derived primarily from certain detergents, industrial wastes and fertilizers) are **nutrients supportive of growth in plants and certain other organisms. High levels of nitrates and phosphates in water bodies promote the growth of certain algae, which, if allowed to grow excessively, can deplete the levels of oxygen in water such that fish and other aquatic life** (which also depend on the oxygen in the water to live) **may die.** Also, because **one major source of nitrates is human and animal wastes**, nitrate is a reliable indicator of pollution. Other reasons for high nitrate and phosphate levels in bodies of water can be drainage from agricultural land where fertilizers are applied (as fertilizers are designed to provide nitrogen and phosphorous for plant growth).

Fecal coliform organisms **are bacteria exclusively found in feces** (both human feces as well as in the feces of other animals such as cattle, birds etc). *A high level of fecal coliforms is interpreted to mean that there is a possibility of the presence of organisms capable of producing disease (pathogens^a).* The most common fecal coliform is Escherichia coli and this group of bacteria is used as an indicator for pathogenic bacteria since their die-off rates are generally similar.

^a Bacteria, viruses or cysts which can cause disease (for example, typhoid, cholera, dysentery) in a host (such as a person) are termed "pathogenic"

There are usually between 500 million and 5,000 million fecal coliform per gallon of raw domestic sewage - the number of coliforms is estimated by special techniques in the laboratory and the results are normally expressed as the "Most Probable Number" or MPN per 100 ml.

The table following shows, for a typical North American family, the **other main characteristics of the various components of sewage** (domestic or residential wastewater) – i.e. those of particular concern for pollution of our environment by sewage:

Source	Approximate flow per person in gallons per day	Milligrams per liter – mg/l			
		Biological Oxygen demand	Chemical Oxygen Demand	(Ammonia) Nitrogen	Ortho-Phosphate
Kitchen sink	3	675	1380	5.4	12.7
Bathtub	7	190	280	1.3	1
Face basin	2	235	380	1.2	48.8
Washing Machine	6	280	725	11.3	171
Toilet	17	315	900	37.1	77

As you can see the toilet, kitchen sink and washing machine in the average North American home contribute the largest oxygen demands, the toilet the most nitrogen (because of the feces and urine) and the washing machine the greatest amount of phosphate (because of the detergent used) – although the face basin also contributes a significant phosphate load, once again because of the soap and toothpaste used and the effects of washing off make-up! The oxygen demand generated by the waste from the kitchen sink is primarily attributable to oil, fat grease and food scraps from dirty plates and cooking pots and pans.

In Jamaica, the numbers will be somewhat different because of our differing life style but the foregoing remains a useful illustration of the relative contributions of our various household plumbing fixtures to the average residential sewage discharge.

However, in particular, in Jamaica **there is often excessive quantities of fats, oil & grease (FOG) in sewage discharges from hotels, restaurants and, indeed, from many individual homes** . FOG results in major operational problems both in the collecting sewers and at treatment facilities. FOG solidifies on the inside of sewers restricting the flow of sewage, similar to the way that cholesterol restricts the flow of blood through arteries and veins. At treatment plants a high level of fats, oils and grease in the sewage inhibits the biological treatment processes used by the NWC to treat collected sewage. In addition, where an NWC system serves major beachfront hotels, such as Negril, **excessive volumes of sand discharged into NWC sewers creates major problems for the operation and maintenance of sewage pumping plant. *These issues, FOG and sand, are of such significance that a separate section of this manual is dedicated to the problem and how NWC customers can help!***

Wastewater, however, may have a significantly different character depending on the nature of its various sources and **industrial wastewater** will contain at least as many different chemical compounds as (domestic) sewage and very often more.

Industrial wastewater will generally differ from domestic sewage in the proportion of organic materials and inorganic salts present. Industrial wastewater often has either a very high organic content or a high proportion of salts.

The high organic content may be easily biodegradable* (such as slaughterhouse or milk processing waste) or not readily biodegradable (such as textile industry waste).

Some industrial wastewater may arise from activities that may be appear apparently simple - like the cleaning by garage operators or mechanics of motor vehicle engines (or component parts) of oily coatings or, say, dry-cleaning of clothes and fabrics. While such processes may appear simple, the resulting wastewater can be extremely complex and difficult to treat by simple cost efficient means. The oil and grease washed off an engine are complex chemicals and as anyone who has tried to clean up the oil and grease stains on a driveway or carport knows, they do not readily decay and disappear. Some industrial cleaners used in certain dry cleaning processes can pollute groundwater such that it can no longer be readily used as drinking water.

To illustrate the differences between sewage and industrial wastewater we should note the difference in discharge standards that the National Resource Conservation Authority applies to **sewage** effluent as opposed to "**trade**" effluent discharges ("trade" effluents being defined by NRCA as all wastewater produced in the course of any trade or industrial process other than domestic or residential sewage).

To meet NRCA standards the **treated sewage effluent** discharged from **existing** sewage treatment works (approved before 1st January 1997[®]) must be of a quality equal to or better than the following:

Parameter	Maximum Level
Biological Oxygen Demand, BOD ₅	20 mg/l
Chemical Oxygen Demand, COD	100 mg/l
Total suspended Solids, TSS	30 mg/l
Nitrates (measured as Nitrogen)	30 mg/l
Phosphates	10 mg/l
Fecal Coliform	1000 MPN per 100 ml

In addition, **treated sewage effluent must also have a pH within the range of 6.5 to 8.5** - *the degree of acidity of water is measured in terms of pH. A pH of 7 represents neutral water, neither acidic nor alkaline; pH's either above or below 7 represent a potentially corrosive water with above being "caustic" and below 7*

* Material that can be broken down by naturally occurring bacteria to more stable chemical forms that will not create a nuisance or give off foul odours is considered "biodegradable".

® The NRCA has established further, more stringent, standards for proposed sewage schemes, which provide for a reduced Total Suspended Solids limit at 20 mg/l, a Total Nitrogen (as opposed to Nitrate) limit of 10 mg/l and a phosphate limit of 4 mg/l. Where the effluent is to be discharged to a body of fresh water (as opposed to the sea) the allowable fecal coliform count is also reduced to 200 MPN per 100 ml and the effluent shall exhibit a disinfecting dose of chlorine with a free residual of chlorine of some 1.5 mg/l.

being “acidic”. pH is an important factor in chemical and biological systems and effluent discharges should have a pH close to neutral.

Further, **as temperature affects the natural self-purification process in water bodies** (as higher temperatures accelerate the biodegradation of organic material in the water and the solubility of oxygen in water declines as temperature rises, the combination of high water temperatures and organic load can result in total oxygen depletion and obnoxious septic* conditions), **the effect of any sewage effluent discharge on the water body into which it is discharged should not result in a change of ambient (normal) water temperature of more than 2° C.**

Hence the range of parameters for normal sewage are relatively few – because **it is known that normal sewage does not contain high concentrations of other specific metals, salts and other chemicals that are potentially harmful to our environment.**

Let us, in comparison review regulated parameters set by the NRCA for “trade” or industrial effluent discharges.

Trade Effluent discharges must **not** only comply with the above standards for sewage effluent but must also **not** contain more than the following levels of other contaminants listed below:

Parameter	Standard Limit
Ammonia/Ammonium	1 mg/l
Barium	5 mg/l
Boron	0.5 mg/l
Calcium	5 mg/l
Colour	100 TCU
Detergent	15 mg/l or less than 0.015 kg / 1000kg of product
Fluoride	3 mg/l
Iron	3 mg/l
Manganese	1 mg/l
Oil & Grease	10 mg/l or less than 0.01 kg / 1000kg of product
Phenols	0.1 mg/l
Phosphate	5 mg/l
Sodium	100 mg/l
Sulphate	250 mg/l
Sulphide	0.2 mg/l
Total Dissolved Solids	1000 mg/l

Parameter	Standard Limit
Total Organic Carbon	100 mg/l
Total Suspended Solids	At ALL times < 150 NTU Monthly average < 50 NTU
Heavy Metals	
Arsenic	0.5 mg/l
Cadmium	0.1 mg/l
Chromium	1 mg/l
Copper	0.1 mg/l
Cyanide (free HCN)	0.1 mg/l
Total Cyanide	0.2 mg/l
Lead	0.1 mg/l
Mercury	0.02 mg/l
Nickel	1 mg/l
Selenium	0.5 mg/l
Silver	0.1 mg/l

⁺ Organic waste, such as the materials that makes up the major portion of sewage, can be readily decomposed by various naturally occurring bacteria. Some bacteria can only live when oxygen is not present while others need oxygen to live. The first type of bacteria decompose waste in a process that creates gases that have obnoxious smells but when the second type of bacteria is present they further decompose these gases such that there is no smell. Where, in normal sewage oxygen is absent, decomposition occurs only by first set of bacteria and obnoxious smells result – a condition know as septicity.

While we may not be familiar with all of the above chemical names, that is not necessary for us to recognize that, compared to sewage, the list of regulated contaminants for **industrial wastewater effluent** discharge is much wider in its range – as an excessive amount of any of the listed contaminants can be harmful to our environment and may be present in wastewater generated by various industrial processes. These same contaminants are **not** present in normal sewage – once again, provided that we do not put down our toilets or drains any things that should not be disposed off in that way - and hence need not be regulated for normal treated sewage effluent discharges!

MAINTENANCE OF THE SEWAGE COLLECTION SYSTEM

A sewage collection system (whether on the customer's property or a part of the NWC's system) will normally comprise a system of sewers (gravity flow pipes), manholes and pumping stations / pumping mains.

Each element must be regularly inspected, checked, serviced and, as necessary, repaired.

Those parts of the sewage collection system for which the NWC is responsible (i.e. those elements outside of private property boundaries, in the public road reservation or specific public wayleaves) will be maintained by the NWC – ***BUT, if an NWC sewer or lateral becomes blocked because of prohibited discharges from a particular property (i.e. discharges not in accordance with the property's Consent-to-Discharge) and this can be clearly identified, then the NWC may charge the offending property owner/occupier for the full costs of any cleaning or repair costs incurred.***

The responsibility for the maintenance of sewage facilities that are within the boundaries of any private property rests solely with the owner/occupier of the particular property.

Properly designed and constructed house sewer facilities on a private property will usually give many years of trouble free service - **PROVIDED the facilities are used properly** (*remember grease and other traps must be cleaned out regularly*) **and only those things that should go down the drain or the toilet are disposed off in those ways!** However problems may still occur on the best constructed and best managed property system.

However, other than regular cleaning of grease and other traps, **the NWC strongly recommends that**, unless they have received professional training (*and so possess the particular, relevant skills needed*) **property owners/occupiers should neither attempt to**

undertake their own maintenance - nor any necessary repairs - but rather employ competent professionals experienced in the field for such services.

The reasons for this advice are two-fold.

Firstly, we are dealing with sewage potentially contaminated with health threatening germs. (*Note that grease, grit and oil traps should not, if properly designed and constructed, receive any "foul" or "black" water discharges and therefore their cleaning does not carry the same level of health risk*).

Secondly, many of the problems that are often experienced relate to blockages and failures that can mean that raw sewage has been "detained" – in a sewer, manhole or pump sump - for some time and has turned "septic". This process of sewage turning septic can generate significant volumes of gases. These gases can be trapped inside the system (until someone opens a manhole or a pump sump cover) and they are either potentially explosive (e.g. methane) or can quickly create breathing problems for humans.

Sewage system maintenance is therefore NOT a job for amateurs.

If, you experience major problems with your house sewer facilities and have been unable to have them satisfactorily resolved, please contact your local NWC Sewage personnel – they are always willing to offer their professional advice and, under certain circumstances, as a paid service, may be able to offer you direct assistance.

However, this section of the manual is intended to inform NWC sewage customers of things to look out for when they have problems and the probable remedy for those problems that are frequently experienced.

However before reviewing some common problems and solutions, **SOME NOTES ABOUT HEALTH AND SAFETY.**

First, **remember that your system carries SEWAGE.** Therefore proper hygiene and safety rules must be followed by all persons who interact with any sewage system (even when doing simple inspections).

The most important rules are: -

- ❑ **DO NOT EAT, DRINK OR SMOKE WHILE WORKING ON ANY SEWAGE SYSTEM**
– hands can easily become contaminated with sewage and any of the foregoing actions can readily transfer germs to the mouth.
- ❑ **DO NOT WORK WITH SEWAGE IF YOU HAVE ANY UNHEALED SKIN SCRATCHES, CUTS OR ANY OTHER LESIONS** – these can provide another ready point of direct access for germs into your body
- ❑ **WASH YOUR HANDS THOROUGHLY** (and any other parts of your body that may have come into contact with sewage) **AFTER WORKING WITH SEWAGE AND BEFORE YOU DO ANYTHING ELSE**
- ❑ **PARTICULAR CARE SHOULD BE TAKEN WHEN OPENING MANHOLES AND PUMP SUMPS** - to avoid the effects of sewer gases and the danger of explosion.

Smoking or naked flames are a definite NO-NO! - after removing a manhole or sump cover always allow some minutes to elapse – to allow any accumulated gases to dissipate - BEFORE attempting to inspect the interior.

Two persons should always be present – one to carry out the inspection and the second to watch out for the first (ready to assist in any emergency).

- ❑ Because of the slippery surfaces, the danger of being overcome by sewage gases and the potential for drowning, **PARTICULAR CARE MUST BE TAKEN WHEN A WORKER HAS TO ACTUALLY ENTER A PUMP SUMP.**

Anyone doing so must be securely attached to a safety rope held by the second person outside the immediate work area. The “safety” person should be alert to the potential dangers, stay in constant communication with the person working below and always be fully ready to respond to any indication of problems below by immediately pulling the worker below into the fresh air.

Now that those critical points have been dealt with let us examine possible sewerage problems and solutions.

Sewage system problems are usually related to: -

- Full or partial sewer blockages. These may occur for a variety of reasons including grease blockages, sand and grit accumulations, root intrusions through pipe joints or cracked pipes or simply because a sanitary towel (or similar item) has been flushed down a toilet and has become stuck in a pipe joint (resulting in other solids then accumulating).
- Pump blockages or failure of any of the mechanical and electrical equipment (pumps, motors, electrical power facilities, pump control facilities, valves etc.) associated with the pumping of sewage.

Manholes

When a sewer is blocked the first task is to identify the likely location of the blockage.

Manholes are a key component of any properly designed sewage collection system. They provide access to gravity sewers at regular intervals along their length and inspection of conditions in a manhole can often provide the first indication as to the location of a total sewer blockage or of the potential for a full blockage to develop within a short time in the future.

Manholes should therefore be regularly inspected to check for any evidence of surcharging. If debris is found on the tops of the "benching" (the smooth concrete forming the flow channels in the bottom of each manhole) or if the walls of the manhole are badly soiled, it is likely that the manhole has regularly been "surcharged" because of some partial blockage downstream restricting the free flow of the sewage.

Surcharging occurs because the speed with which sewage enters the manhole (through the upstream clear sewer) is greater than that of the sewage flowing out of the manhole through the

downstream "choked" sewer and hence the sewage "backs up" in the manhole itself.

If there is any evidence of surcharging of a manhole, the downstream cause should be identified and rectified.

Of course, if a manhole is opened and found to be full of sewage then it is clear that the downstream sewer is completely blocked and that blockage will need to be removed.

Additionally however, every manhole should be regularly inspected to check on: -

- The integrity of the manhole cover. The cover itself should be seated properly within the frame without rocking and the cover should effectively seal the manhole against the entry of surface water. There should be no holes through the cover and cracked, holed or broken covers should be replaced.
- The integrity of the manhole walls. The walls should show no evidence of cracking (which would allow the infiltration of groundwater or leakage of sewage). Any evidence of cracking or other structural failure should be a further investigated and appropriate repair undertaken *
- The presence of debris in the manhole. The benched channels in the manhole should be clear and free of any debris. All debris in the manhole should be manually removed and any remaining debris flushed down the outgoing sewer as a part of regular sewer flushing programmes. Following debris removal and flushing the condition of the haunched channel surfaces should be visually examined and any scour damage to the (smooth and hard) concrete benching should be made good *.

** To effect repairs to manholes walls or benched channels, any sewage flows must be "over-pumped" from the immediately upstream manhole (with a suitable barrier installed on that*

manhole outlet sewer to prevent flow into that sewer) to the next manhole downstream. This can be quite costly, as it requires potable pumping equipment and long lengths of pump discharge hoses. Once over-pumping has been established all internal surfaces of the manhole to which repairs are to be executed should be thoroughly washed down with a high pressure water stream.

Sewers

As previously noted, full or partial sewer blockages may occur for a variety of reasons including: -

1. Grease blockages
2. Sand and grit accumulations
3. Root intrusions through pipe joints or cracked pipes, or,
4. Simply because a sanitary towel (or similar item) has been flushed down a toilet and has become stuck in a pipe joint (resulting in other solids then accumulating).

The exact location of sewer blockages and the reason for them can be determined by professional organizations using “closed circuit television” (CCTV) inspections – where a TV camera is used in a sewer to inspect internal conditions. CCTV equipment is however expensive.

Professional personnel can however remove most sewer blockages without specific CCTV inspections using a variety of techniques ranging from simple flushing with high volumes of water through “rodding and flushing” to high pressure “jetting” and rotary cutting.

Rodding, as the name implies, employs the use of lengths of flexible rods (screwed to one another as they are pushed into the sewer pipe) to dislodge the material causing the blockage so that it may be flushed through the sewer to the downstream manhole (where it may be removed) using water. While rodding can usually deal with

the type of blockage referred to at item 4 above, it is not fully effective for the first three types of blockages noted above – as it cannot specifically fully remove grease or grit build up and cannot target plant roots intruding into sewer pipes.

Jetting employs a specially designed discharge nozzle fed by a high pressure water pump to “jet” grease build up off all sewer surfaces and to flush other accumulated debris out of the sewer. It is however a specialized technique - care is necessary to avoid over jetting of any particular location as the high water pressures involved can quickly destroy certain sewer pipe by literally “blasting” a hole through the pipe wall.

If root intrusion is the problem, once again specialist equipment is available to allow rotary cutters to remove root material growing into the sewer. However such cutting is likely to have to be repeated at regular intervals as the roots will tend to grow back —unless the offending tree or bush is physically removed from the ground above the sewer.

Maintenance of Pumps

The routine servicing and repair of electrical and mechanical equipment (such as pumps and their associated power supplies and control systems) should always be carried out by professionals skilled and experienced in these fields – NOT the homeowner or handyman.

Proper design/construction and observance of good “sewage” disposal practices are the keys to minimizing pumping problems.

For example, pumping equipment designs must include adequate protection against such circumstances as:

- ◆ Supply voltage fluctuations (which can otherwise damage or destroy electrical components),
- ◆ Electrical over-current failures to protect the motor from trying to turn a jammed pump

(which could otherwise cause the motor to “burn out”)

- ◆ Dry running of the pump and motor (when the “water” falls below the minimum for safe pump operation)

Proper and appropriate designs must however be complemented by good quality components – a sewage pumping facility is not a facility on which to “scrimp and save”.

However, mechanical and electrical equipment will eventually deteriorate with use and age. To ensure that maximum “life” is obtained from such equipment regular routine inspection and servicing is important

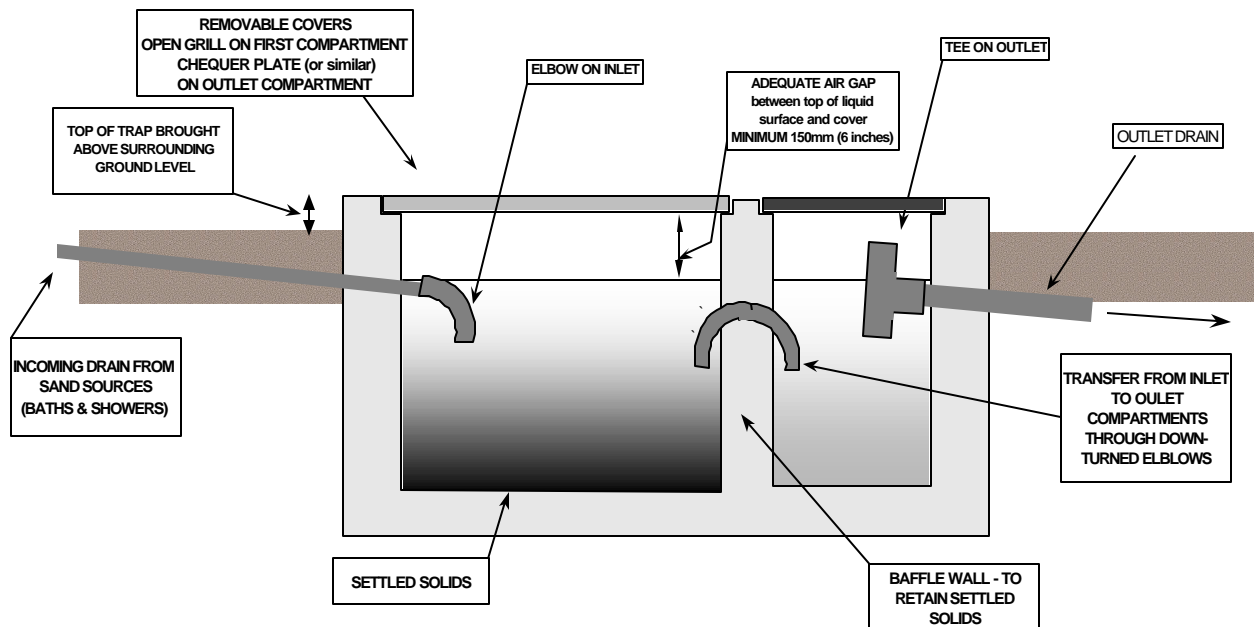
The NWC strongly recommends that sewage customers have this done – regularly – by trained professionals!

SAND and SEWAGE don't mix!

While many of our hotels (guest houses and public beaches) provide fresh water showers at the beach to enable their guests to wash sand off before they return to their hotel or guesthouse rooms, many guests do not utilize them but return to their rooms to bathe or shower. This inevitably contributes large quantities of sand to their gray water flows. This can become a major problem in NWC sewers and pumping stations – causing blockages and septic conditions resulting in smells.

Therefore “best practice” design for guest properties on the beach and public shower facilities should provide for these particular waste flows to pass through a suitably sized sand trap – before the flow joins other gray water flows and, most particularly, **BEFORE IT JOINS ANY BLACK or FOUL SEWAGE FLOWS (FROM TOILETS AND URINALS).**

The following diagram shows a typical sand trap – but please note that few dimensions are given – this is deliberate as each property and the way in which bath and shower water drainage is plumbed will be unique and the size and configuration of each trap necessary must fit each particular situation.



It is recognized that many existing properties (particularly those with more than one storey guest accommodation buildings) may have their bath / shower drains connected directly into a common, black and gray water down stack. This will mean that significant plumbing alterations will be required – if this is your situation please discuss this issue with NWC’s professional engineers and we will work with you to find the best and most economical solution - in the meantime **PLEASE TAKE THE EXTRA STEP TOWARDS SENSITIZING YOUR GUESTS AND MONITORING THEIR BEHAVIOUR – POLITELY, OF COURSE.**

FATS, OILS AND GREASES – a.k.a. “F O G!”

Fats, oils & grease (often referred to as **FOG**) are universal problem substances in sewage. High levels of FOG in customer discharges will result in major operational problems both in NWC's sewers and at sewage treatment facilities.

FOG is a primary source of sewer odours, whether inside a building or emanating from a sewer line in the street or an NWC pumping station.

Excessive FOG in sewage discharges can come from just about any source ranging from a studio apartment to a large industrial facility.

However, although automobile garages and service shops can represent a major source of certain oils and greases (and are specifically addressed in the section entitled “Oil and Sewage Do Not Mix”), **most FOG arises from food preparation activities and the washing of dirty crockery, cooking pots, pans and utensils** (but not generally from commercial deep-frying units - as many people might otherwise think),

So, major sources of FOG are hotels, restaurants, bars & grills, cafeterias, grocery stores, supermarkets, food processing facilities and apartment blocks.

But our ordinary kitchen sink at home can be a part of the problem - every individual home is a potential source of excessive FOG.

FOG is the number 1 cause of sewer back-ups in homes and food service establishments. Even a small amount in drains can cause a serious (and expensive) plumbing blockage, or even worse, an overflow in your home or your community.

Most FOG is not soluble - it does not mix well with water – and most FOG weighs less than water.

So, FOG floats on water and clings to surface areas void of water.

This is why grease collects on the upper parts of drain lines first. As additional FOG flows down a drain, the drain will eventually clog. If the clog occurs in the drain close to where the FOG originated then only that drain is affected. However, if the FOG blocks the main house sewer on the customer's property then all drains on that property can be affected and - most particularly, **black water from the toilets can back up and overflow inside bathrooms!**

FOG that does not collect inside the drains on customer's property ends up in the NWC sewer system. There the FOG solidifies on the inside of sewers restricting the flow of sewage – just as cholesterol restricts the flow of blood through arteries and veins. Sewer blockages can result from this FOG build up, once again causing raw sewage to back up into homes and businesses.

If FOG does manage to find its way through NWC sewers it will create problems at NWC pumping stations, fouling the pump and the pumping equipment sumps - creating serious odour problems for everyone.

Even if FOG eventually manages to reach the sewage treatment works, it remains a problem substance due to its molecular structure. It will foul equipment and controls at treatment facilities and a high concentration of fats, oils and grease inhibits the biological processes used to treat sewage.

FOG discharged into NWC sewers simply requires much more time, energy, and resources to manage than other, more common organic wastes.

Managing discharged FOG is expensive. The more it costs the NWC to maintain the sewer system, the more it eventually costs you, our customer.

The following pages will help you to do your part by minimizing the FOG that you put into NWC sewers.

HAVE YOU EVER HAD YOUR SEWER DRAINS PLUG UP AND BACK UP INTO YOUR HOME OR BUSINESS?

Hopefully not.

But if you are not careful, it can happen.

Many blockages are caused by disposing of fats, oils, and greases (FOG) down the drain.

Over time they build up inside the pipe that connects your home or building to the public sewer, eventually plugging it completely. When this happens, the sewer draining from your home or business backs up and overflows onto your property or into your home or business.

The good news is that both homeowners and businesses can easily avoid this messy and expensive problem – using two simple strategies:

1. **Install a grease trap on the kitchen drain**
2. **Simply do not let fats, oils and grease go down your drain!**

The first - the use of a grease trap on “kitchen” drains - is mandatory for all NWC sewage customers.

However, even where a proper grease trap has been installed, the second strategy still remains the most important method of ensuring that neither your drains nor the NWC sewers get clogged by the discharge of excessive amounts of FOG!

So here are some helpful tips for NWC customers.

HOMEOWNERS

Homeowners can greatly reduce the chance of a grease blockage by **not** using the kitchen sink for food scraps.

Vegetable and meat scraps, salad dressing, rice, butter, cooking oils, and many other common

culinary delights quickly turn to grease that will eventually block your sewer.

So, before washing dirty dishes, plates and cooking pots and pans, always use a paper towel or rubber spatula to thoroughly wipe or scrape food scraps and grease into the garbage can.

(Please also note that if you have an in-sink garbage disposal, reducing or eliminating the use of your garbage disposal will lower your water and sewer bills - such disposal units use a large volume of water)

Let melted grease used for cooking solidify in a container on the counter or in the refrigerator before placing the container into the garbage.

Store spent cooking oil by pouring it into an old jar, coffee can, or plastic bag with a zip closure. When full, seal the container and tie it up in a plastic bag (a “scandal” bag works well) and dispose of it with the garbage.

REMEMBER - It is always best to put FOG in the garbage instead of the drain

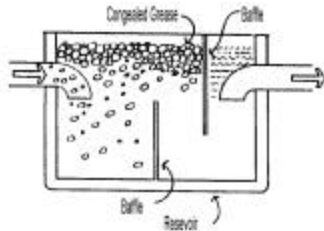
However even with the best of kitchen practices some FOG will still go down your kitchen drain. Thus the NWC requires that you install a grease trap on your kitchen sink drain immediately outside of your kitchen.

What is a Grease Trap?

A Grease Trap is a device designed to collect FOG from wastewater discharged from restaurants and food preparation facilities.

It does this by separating the FOG from the wastewater by gravity. Since grease weighs less than water, the grease floats and can be skimmed from the surface of the wastewater.

The drawing at the top of the next page shows a diagrammatic view of a typical small-scale grease trap that is available overseas as a pre-fabricated item.



(Note: - a diagram of a simple "single residence" grease trap that can be inexpensively constructed locally is given in the appendix to this section. It works on the same principles as described below.)

The drainage from the kitchen sink comes into the trap at the left-hand side.

The first baffle ensures that any solids present in the flow that are heavier than water settle to the bottom of the trap (typically food scraps and vegetable peelings) It also allows the "lighter than water" grease and fat to rise to the surface where it floats.

The second baffle ensures that this floating fat and grease cannot reach the outlet pipe on the right-hand side of the trap.

So ... instead of continuing down the drain and into the NWC sewer the grease stays in the trap.

Of course, the trap needs to be cleaned out regularly and this must be done properly. All too often the trap is "cleaned" by simply flushing it with hot water and stirring the contents up this simply moves some of the FOG and settled solids out of the trap and into the NWC sewer defeating the whole purpose of the trap.

Instead, please use a garden spade to lift the floating FOG out onto old newspapers and then similarly lift out the "settled" material at the bottom of the trap. Wrap this waste up, put it into

a scandal bag, tie the bag up and put it in your garbage. Then replace the cover and **WASH YOUR HANDS THOROUGHLY.**

Do this regularly and your trap will not be a problem.

So, HOMEOWNERS, PLEASE DO YOUR PART!

COMMERCIAL CUSTOMERS with "FOG" ISSUES

Commercial customers who discharge fats, oils, and greases **are required by the NWC to pass their discharges that contain fats, oils, and greases through a properly designed grease trap of proper size** – please note that toilet and urinal wastes should **NOT** be connected through any such grease trap.

Some basic parameters for the design of commercial grease traps, or grease interceptors, are given below BUT each particular business is unique and the design of large-scale grease interceptors should be entrusted to an appropriate professional engineer.

However, operating a good grease abatement program also makes good business sense. A grease blockage can shut a business down for several days and cost thousands of dollars in lost profits and cleanup expenses. A little investment and sound routine preventative maintenance will ensure that you meet NWC requirements and avoid this costly problem.

First, keep your "gray" and "black" water drains separate. Black water lines are drain lines for toilets and urinals in restrooms. In addition, keep your gray water lines from grease-laden kitchen sinks etc., separate from the gray water drains restroom wash-basins/showers etc.

Second, insist that your staff scrape all plates, pots and pans into the garbage before they go for washing.

Third, drain waste cooking oils and grease into a grease-recycling container for pickup by a grease rendering company (or, if your volumes of oils and grease are not large enough for this, do what you do at home - put it into an old jar, coffee can, or plastic bag with a zip closure, put this in a scandal bag and dispose of it in the garbage!).

Fourth, maintain your grease trap regularly and properly. **Do NOT use enzymes or commercial “cleaners” in your trap.** There are many products on the market sold as being specifically for grease trap cleaning. These will work – up to a point – BUT will usually simply move the grease further down your drain system or into the NWC’s sewer AND cause a blockage there.

The owners/operators of larger commercial establishments, should **NOTE** that the pot washing sink, pre-rinse station prior to the dish washer, trenches and floor drains fed by soup kettles, automatic & manual ventilation hoods, etc., are the major sources of grease discharges to the sewer system (and not commercial deep-frying units as most people might think) – **so, please, ensure your drainage system is properly designed to deal with ALL grease.**

How can FOG discharges be controlled and minimized by commercial sewage customers?

There is only one way - by installing and maintaining a **properly sized** grease trap on the drain from kitchen sinks and commercial washing operations – **before** this particular wastewater joins the other flows going to the public sewer.

What size should the grease trap be?

There have been no definitive rules established for the sizing of large grease traps for commercial establishments that are found universally acceptable - *usually, if in doubt, the bigger the better and if you have to remove accumulated grease too often then your trap is too small!* However the Uniform Plumbing Code (UPC) published by the International Association of Plumbing and Mechanical Officials, headquartered in the United States, provides some guidelines for the sizing of grease traps for commercial kitchens that are mandatory in much of the United States.

These suggest that, for commercial kitchens, the size be derived from the formula: -

$$\text{Required Liquid Capacity} = N \times W \times R \times S$$

Where N is the number of meals served in the peak hour, W is a Waste Flow Rate, R is the necessary Retention Time and S the required Storage Factor.

The UPC suggests the following values for W, R and S: -

W - Waste Flow Rate

With dish washing machine	22.7 litres flow
Without dishwashing machine	18.9 litre flow
Single service kitchen	7.6 litre flow
Food waste disposer	3.8 litre flow

R – Retention Times

Commercial Kitchen Dishwasher	2.5 hours
Single service kitchen – single serving	1.5 hours

S – Storage Factors

Fully equipped commercial kitchen with 8 hour operation	1
with 16 hour operation	2
with 24 hour operation	3
Single Service Kitchen	1.5

However, it is strongly suggested that for commercial establishments producing a lot of FOG – restaurants and hotels – the grease trap should have a minimum capacity of at least 70 litres (15 imperial gallons) per seat in any (and each) restaurant.

Of course, in addition to be of adequate size the “commercial” grease trap must also be properly designed – so that it functions efficiently in the same way as the recommended “domestic” grease trap.

The following represent appropriate parameters for **guidance** for in-situ large grease trap construction, using materials locally available in Jamaica: -

- All grease traps must have at least two compartments.
- The total trap volume should be no less than 2000 litres (approximately 440 imperial gallons).
- The inlet compartment (plus any intermediate compartments, if more than two are provided) should be two-thirds (2/3) of the total trap volume and should be internally longer than the maximum inside width.
- The liquid depth should be no less than 350mm (14 inches) nor greater than 1.75 metres (approximately 6 feet).
- Each grease trap should have at least 0.5 square meters (5 square feet) of surface area for every 100 litres (220 imperial gallons) of liquid capacity.
- If the trap is buried below grade, the minimum acceptable trap access will comprise a manhole (clear opening not less than 500mm X 500mm) over the inlet and outlet but an additional manhole should be provided for each 3 metre of length for traps longer than 5 metres. Manholes should be brought above the surrounding grade and equipped with secure gasketed covers of suitable strength and style. Where the walls of the trap are brought above the surrounding grade (for improved access) alternative full width removable access covers of appropriate strength and weight are acceptable.

- The inlet and outlet should have a “baffle” tee or similar device extending from a minimum of 100mm (4 inches) above the liquid level to within 300mm (12 inches) of the inside floor.
- Adequate partitions or baffles of sound and durable material (*wood should not be used*) should be constructed between compartments and should extend at least 150mm above the liquid surface. Flow from one compartment to the next should be through an extended elbow reaching to within 300mm (12 inches) of the inside floor of the upstream compartment.
- The cover(s) should be a minimum of 230mm (9 inches) above the liquid level subject to the air space provided being not less than one eighth (12½%) of the total liquid volume.
- Grease traps should be constructed of appropriate materials (walls to be of in-situ reinforced concrete, with adequate cover to all steel reinforcement, or may be of concrete filled block-work – in either case of appropriate dimensions adequately reinforced for structural strength under earthquake loading) and all traps should be fully watertight (and tested to so prove)

Owners and operators of commercial kitchens may also note that there are proprietary pre-fabricated grease traps available offshore – and automated grease skimming and removal equipment is available in the United States and elsewhere.

However, ALL designs and specifications for sewage systems for properties connected to or to be connected to an NWC sewer MUST be vetted and approved by the NWC.

Routine maintenance of larger grease traps on commercial and institutional premise includes the regular removal of accumulated grease and, it is suggested, a monthly inspection to determine the grease layer thickness and to identify any repairs or other maintenance necessary. Pumped out grease can either be **re-cycled** (there are grease re-cycling companies in Jamaica) or should be hauled away and properly disposed to a solid

waste disposal **facility by an accredited septic tanker service.**

Can a garbage disposal unit be used in a restaurant or food preparation facility?

The guidelines for “commercial” grease traps provided above are specifically formulated for “best practice” discharges of kitchen waste **WITHOUT** copious quantities of food scraps. – **and reflect the NWC’s official position (as included on the Consent to Discharge) that the discharge of wastes from grinders and in-sink garbage disposals to NWC sewers are prohibited.**

Under certain circumstances however, the NWC may relax this condition for large commercial customers BUT ONLY where either a separate trap (of appropriate design and adequate size) is provided upstream of the grease trap for settling solids or if the grease trap size has been demonstrably designed to accept garbage disposal unit discharges– and only for customers who demonstrate a commitment to proper trap maintenance!

IMPORTANT NOTE ON FOG DISCHARGE LIMITS

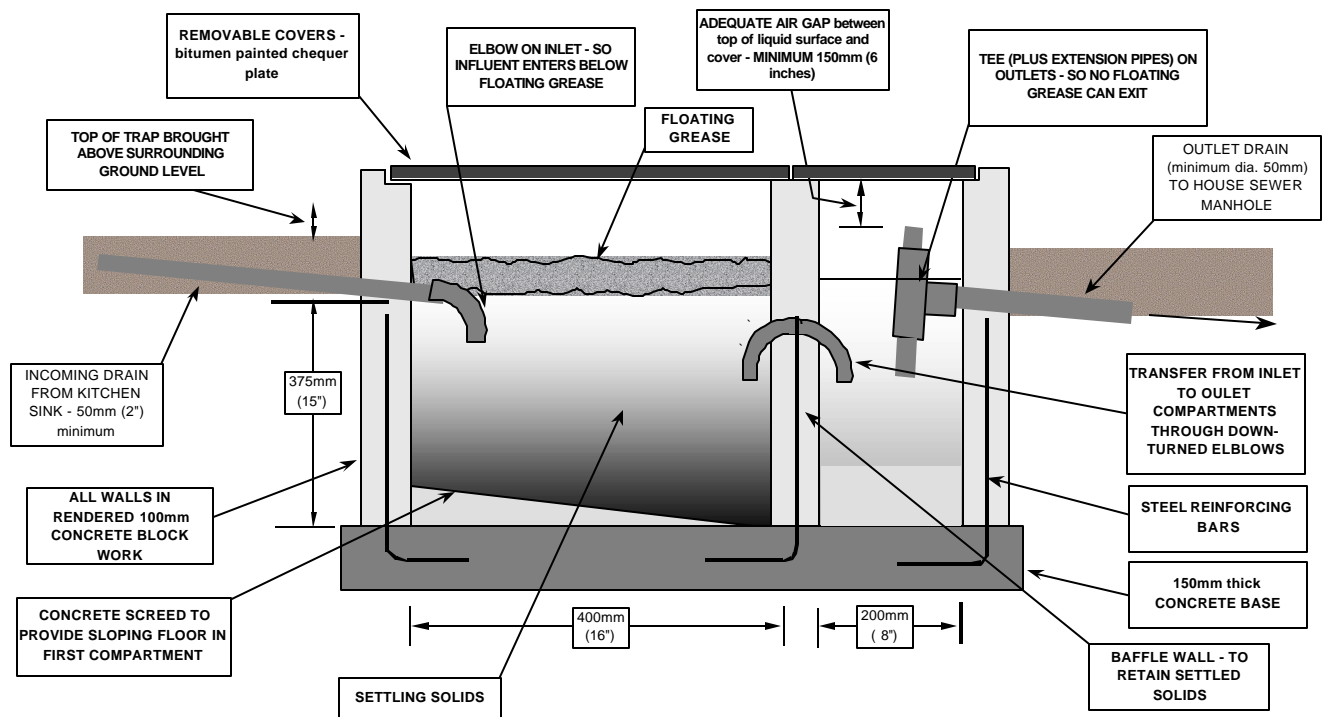
The NWC has established a FOG discharge limit of 15 mg/l (effectively parts per million).

This means that

**THERE SHOULD BE NO MORE
THAN TWO (2) TEASPOONS
OF FOG FOR EACH FIVE (5)
GALLONS OF WASTEWATER
DISCHARGED!**

APPENDIX 1

DIAGRAM OF A SINGLE FAMILY RESIDENTIAL KITCHEN GREASE TRAP for in-situ construction in Jamaica using readily available local materials and skills



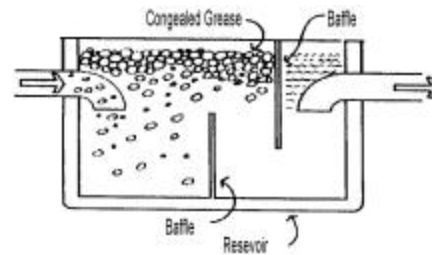
NOTES

1. Inside width to be 300mm (12 inches)
2. The diagram is NOT TO SCALE

FOG, TRAPS and the RESIDENTIAL SEWAGE CUSTOMER

WHAT IS A GREASE TRAP? HOW DOES IT WORK?

A grease trap is a small reservoir built into the drain piping from the kitchen sink immediately outside the kitchen. Baffles in the reservoir retain the drain water long enough for any grease or oil that has gone down the drain rise to the surface. The grease and oil can then be removed and disposed of properly.



HOW CAN I CLEAN MY GREASE TRAP?

The following procedure is recommended:

- Bail out any water in the interceptor to facilitate cleaning.
- Dip the accumulated grease (and solids such as food scraps that have settled in the bottom of your trap) out of the interceptor and onto some old newspapers placed alongside.
- Be sure to scrape the sides and the lid.
- Wrap up the newspaper, put it into a scandal bag and tie it up securely (or use a watertight container that you no longer need) and place in the garbage can.

NOTE: If you clean your trap the day before the garbage is picked up, any problems with odor are minimal.

CLEANING AN INTERCEPTOR FREQUENTLY REDUCES THE AMOUNT OF GREASE AND THE TROUBLE AT CLEANING TIME.

DO NOT flush out the trap with hot water.

DO NOT use drain cleaners, enzymes or bacterial agents – these merely soften the grease and transfer the problem down stream.

DON'T LET FOG MAKE IT CLOG

A message from your NWC sewage division

..... working to keep our sewers working and our environment clean !

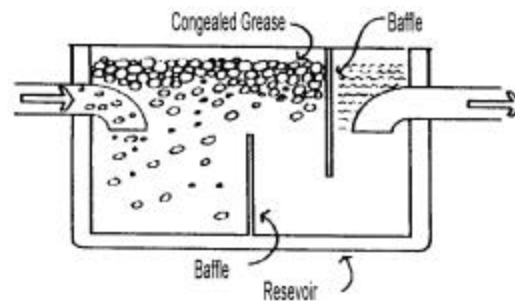
A message from your NWC sewage division

..... working to keep our sewers working and our environment clean !

FOG, TRAPS and the COMMERCIAL SEWAGE CUSTOMER

WHAT IS A GREASE TRAP? HOW DOES IT WORK?

A grease trap is a small reservoir built into the wastewater piping a short distance from any grease or oil producing area. Baffles in the reservoir retain the wastewater long enough for the grease and oil to rise to the surface. The grease and oil can then be removed and disposed of properly.



DO I NEED A GREASE TRAP?

Everyone who uses oils and grease (whether the cooking type or the lubricating type) needs to have a grease trap!

WHAT IF I DON'T INSTALL A GREASE TRAP?

Anyone who is a business owner and the business uses oil or grease in any form will eventually have a maintenance problem with a plugged drain if they do not have a properly designed and sized grease trap. This blockage can create a sewage back-up and ultimately a health problem for your business. Someone will have to pay for removing the blockage. If the problem is in your drain, then you will have direct responsibility for dealing with the matter BUT, if the blockage or restriction is in the NWC sewer and it can be proven that you are the cause of the blockage, then you will also have to pay for the NWC's sewer to be unblocked.

AM I PART OF THE PROBLEM OR THE SOLUTION?

One of the most important things to remember is that if you have a grease trap, maintain it properly. Work out a specific cleaning schedule right for you and your establishment. All grease traps need to have the separated grease cleaned out periodically and no one likes to do it. It is a dirty job. Running extremely hot water down the sewer drain only moves the problem down stream, it does not go away. Do not use drain cleaners, enzymes or bacterial agents – these merely soften the grease and transfer the problem down stream. **Catch the grease at the source, it is the most economical way to reduce all costs.**

IS THE GREASE TRAP I HAVE ADEQUATE?

The size is largely determined by your maintenance schedule. If you have to clean it more often than you think you should, then chances are the size needs to be increased.

THINGS YOU SHOULD KNOW IF YOU OPERATE A RESTAURANT!!!

No two restaurants are operated in like manner. It is important that the method of operation employed in your restaurant be evaluated prior to determining the size of the grease interceptor.

The size of the grease interceptor should be evaluated by a professional civil/sanitary engineer using the following criteria:

- Type of restaurant (drive-in or walk-in)
- Type of food being prepared (fried, baked, broiled, deep fat fried, etc.)
- Seating capacity or quantity of wastewater flow.
- Retention time required for efficient grease trap operation.
- Frequency of maintenance.
- Accessibility of interceptor for maintenance - *a grease trap location as close to the grease producing area as possible is preferable but it should not be directly after hot water is introduced (dishwasher as an example). It must also be installed so no sanitary waste from a toilet will be collected in the grease trap.* Installing the trap outside is a very smart idea!

CAN YOU RECOMMEND A MAINTENANCE SCHEDULE?

All grease interceptors should be cleaned at least twice each year. Some establishments will find it necessary to clean their traps more often than twice per month. If you have to clean it too often then maybe you should think about installing a larger trap.

DON'T LET FOG MAKE IT CLOG

THE CONSENT TO DISCHARGE

The **Consent to Discharge**, illustrated alongside, is a 3-page document that **forms a contract between a property owner and the NWC for the provision of sewage services to the property by the NWC.**

As a contract, it is to be signed by authorized representatives of the property owner and the NWC (the two parties to the contract) in the presence of a witness (who will also sign the document as having witnessed the two parties so sign).

Two copies of the formal document, with the necessary particulars of the connection in question already completed by the NWC and ready for both parties to sign, are to be signed immediately before the NWC permits the final connection of any house sewer facilities to be connected to an NWC sewer - so that the final connection can be made (*a connection made without the prior signature of the Consent is illegal*).

A copy of this document will have been provided by the NWC with each application form and prospective NWC sewage customers should read have already read it carefully by that time ... but if there are any questions about the document please ask - long before it is time to sign. An NWC representative will be happy to explain anything that is not understood - at any time.

The Consent starts out by recording that:

- The Owner or **authorized** Occupier confirms that the house sewer facilities (everything on the private property needed to collect and convey sewage from the property to the NWC's sewer) have been constructed in accordance with the plan approved by the NWC (inclusive of any "pre-treatment facilities – such as grease tarps, oil or sand interceptors etc.), and
- The Owner or **authorized** Occupier **"AGREES AT ALL TIMES TO FAITHFULLY COMPLY WITH THE CONDITIONS SET OUT BELOW"**.

and continues to set out some 11 conditions (*which will be explained below*) and ends, on page 3, with appropriate spaces for the signature of the document by the Owner (or his/her authorized representative), an authorized NWC representative and by a witness. In addition, both parties are to initial the first two pages of the document and the specific list of pre-treatment facilities provided (if any).



The Conditions are mostly simple and straightforward as follows:

- Condition 1** requires that the Consent to Discharge is to be kept at the property and must be available for inspection by an NWC representative at all times – *this is to facilitate the NWC in case of any emergency and during any routine inspection that the NWC may make.*
- Condition 2** **requires that the Owner/Occupier maintains the house sewer facilities** (including any pre-treatment facilities) **in good condition at all times at his/her own cost** – *the facilities on the property belong to the owner of the property and their maintenance is NOT the NWC's responsibility. Poorly maintained facilities on any private property can result in serious problems on the main sewage system.*
- Condition 3** further emphasizes that **the owner/occupier of the premises must clean out any grease, oil or sand traps on the property regularly and dispose of the material removed from such traps properly** – either in the garbage or to a proper waste disposal site. ***Traps that are not cleaned out regularly can become a health hazard for those people living on the property and for their neighbours.*** *Flushing material accumulated in any trap out into the outlet drain or dumping any material removed from any trap into a downstream manhole is simply defeating the purpose of the trap and will result in blockages in NWC sewers or problems at NWC pumping stations or treatment works.*
- Condition 4** **requires that no modification be made to the house sewer facilities without the prior approval of the NWC** – *as the facilities will have been specifically designed to properly serve the needs of the property as it exists at the time of connection, an inappropriate subsequent modification may render the existing system inappropriate and result in improper discharges to the NWC sewer. Therefore, any modification must be made under the same conditions as the original work i.e. with proper, professional designs and the resulting construction work vetted, approved and tested by the NWC.*
- Condition 5** **ensures that authorized NWC representatives may inspect the house sewer facilities at any reasonable time** – *to ensure that everything is as approved and in good working condition – that is, to enable the NWC to check, as may be reasonable necessary, that the property owner/occupier is living up to his end of the contract! Sometimes problems experienced on NWC sewers point to problems within a particular property and the NWC must have reasonable access to that property to check for defects so that, in the common interest of all members of the community affected by the problem, they can determine its real cause and have it fixed.*
- Condition 6** follows on from Condition 5 in that, **if, based on an inspection carried out by the NWC under Condition 5, any of the facilities on a private property require repair or modification** (because of some changes improperly made to the original installation or for any other reason) **the Owner/Occupier is required to have any necessary work carried out, at his/her own cost, within 30 days** of receipt of a Notice from the NWC.

The clause continues to point out that **if such work is not carried out in a timely manner the penalties prescribed by law may be invoked against the Owner/Occupier**. Further, in the event that as a consequence of the failure to undertake the necessary work of repair or modification, improper discharges are made into an NWC sewer, then the penalties that may be invoked include for the NWC to recover any costs that they may incur in dealing with the improper discharges.

Very serious problems can be experienced on NWC's systems as a result of improper discharges with costs potentially running into many thousands of dollars. The discharge of prohibited chemicals can create major treatment problems requiring expensive remedies (and potential lawsuits if the chemicals are hazardous to human life and personal injuries result) while the excessive discharge of fats, oils and greases, garbage and other materials can result in blockages on NWC sewers or breakdown of pumping equipment. The costs which can be incurred for hiring mobile power generators and temporary pumping equipment to transfer sewage through overground hoses from a manhole upstream of a blockage to one below it are very substantial!

For this reason the NWC must take every necessary step to ensure that each NWC sewage customer does his/her part – properly and promptly – for the good of all!

- Condition 7** permits the NWC to sample the sewage flow coming from any property – before it joins other flows in the NWC sewer. This will enable the NWC to clearly document any illegal or improper discharges of major significance and **identify the offender**.
- Condition 8** identifies, in sections (a) to (c), **materials, chemicals and the like which must NOT be discharged into NWC sewers**. The collective Condition 8 represents the **NWC's "Influent Standards"**

The specific prohibitions set out in the three paragraphs of Condition 8 and the reasons for them can be briefly summarized as follows:

Paragraph 8 (a) sets out **general prohibitions** in order to protect

- The NWC's sewers and other sewerage facilities - as some discharges can attack these structures or cause serious corrosion of mechanical plant, e.g. strong acids or caustic solutions can seriously attack concrete structures (and mechanical equipment) and, eventually, literally destroy them
- NWC employees from being exposed to additional health risks, and
- The environment – because NWC treatment plants are specifically designed to treat domestic sewage and many contaminants in industrial or trade wastes will pass directly through such treatment processes unchanged potentially causing serious environmental pollution when ultimately discharged (unless extra money is spent on additional more complex treatment facilities)

by stating that no matter which *"either alone or in combination with any other matter with which it is likely to come into contact in the Commission's public sewage system to which it is connected, would cause damage or obstruct the said public sewage system or cause injury to the health of any person lawfully present in any*

sewer or appurtenances of the said public sewage system, or in or at any sewage pumping station or sewage treatment works connected thereto or therewith through which such discharge passes or would make difficult or expensive its treatment or disposal" shall be discharged into an NWC sewer.

Paragraph 8 (b) states, in rather precise chemical language, the maximum levels of certain specific potential contaminants. However **this paragraph need not concern the average careful and conscientious sewage customer** as most of the referenced contaminants are NOT present in problematic concentrations in ordinary domestic sewage – **provided, of course, that we do not throw into our household sinks, showers/baths or toilets things that should NOT be disposed off that way!**

Many of the contaminants listed at Paragraph 8 (b) may however be present in high concentrations in trade or industrial wastewater discharges and that is why the condition is included on the Consent to Discharge – to protect the environment from industrial waste pollution.

Paragraph 8 (c) complements the general principles established at paragraph (a) **and lists 9 specific things that must NOT be discharged to an NWC sewer.** These are: -

(i) GARBAGE, RAGS, BOTTLES, TINS and OTHER GENERAL REFUSE

Amazingly people do throw these things in their drains, toilets and manholes. Inevitably this results in blockages – often in NWC sewers.

So please,**NO GARBAGE**
down your drains!



(ii) RAIN STORM AND SURFACE WATER DRAINAGE, and

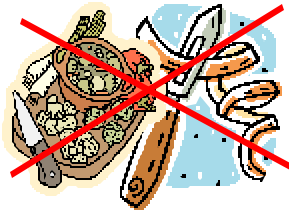
(iii) COOLING WATER, WATER FROM SWIMMING POOLS and the like



The NWC must limit the quantities of simple drainage water (which does not need the level of treatment given, at considerable cost, to sewage) entering their systems - otherwise massive extra costs would have to be incurred in building even bigger collection and treatment facilities – and that would be a waste of all our money.

So **NO RAINWATER, A/C OR SWIMMING POOL DRAINAGE WATER** down NWC
sewers.....PLEASE !

(iv) **WASTE from FOOD GRINDERS**



Fats oils and grease (FOG) are a major problem in NWC sewage systems. Vegetable and meat scraps, salad dressing, rice, butter, cooking oils, and many other common culinary delights that are disposed off down the kitchen drain quickly turn to grease and will eventually block either your sewer or the NWC's public sewer. In-sink waste disposal units or grinders exacerbate this problem as they encourage the disposal "down the drain" of larger pieces of food waste.

So the NWC's rule is **NO WASTE FROM FOOD GRINDERS** into public sewers

(v) **EXCESSIVELY HOT LIQUIDS (specifically wastes with a temperature in excess of 45° C);**

Temperature affects the natural self-purification process in water. If excessively hot wastes are discharged into NWC sewers total oxygen depletion can quickly occur and the resulting septic conditions will create odour problems.

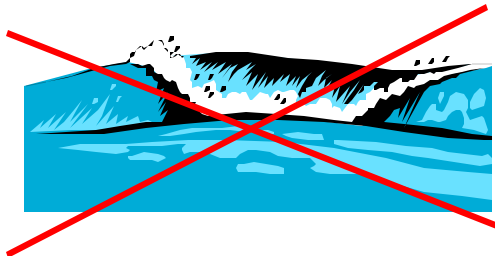
So **NOTHING EXCESSIVELY HOT** down the drain!



(vi) **SEAWATER (whether or not contaminated with sewage);**

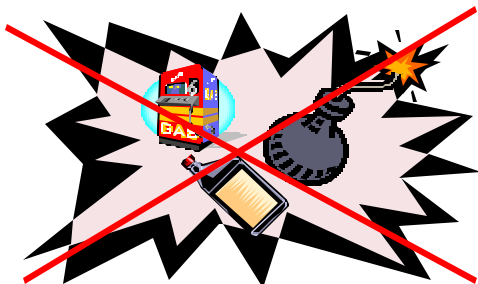
Seawater contains approximately 35,000 mg/l of common salt, Sodium Chloride. Chloride will aggressively attack concrete and affect the balance of bacteria naturally occurring in sewage such that septic and odorous conditions can result.

So **NO SEAWATER** in NWC sewers**PLEASE !**



(vii) INFLAMMABLE WASTES (including petroleum spirit, oils and volatile solvents);

Inflammable wastes must be excluded from public sewers for two reasons. Firstly, for obvious reasons, they create a potential fire and explosion hazard – a danger to both NWC employees and to the public at large. Secondly inflammable wastes are usually complex chemicals that, although eventually biodegradable in nature, require long periods of special bacterial decomposition. Normal sewage treatment plants are not able to handle these obvious industrial wastes efficiently.



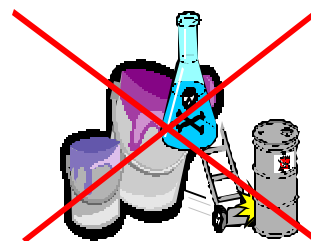
So **NOTHING THAT WILL GO “BANG”** in NWC
sewers

PLEASE!

(viii) Wastes containing STRONG ACIDS OR HARMFUL CHEMICALS, HIGHLY COLOURED MATTERS and THOSE CREATING EXCESSIVELY OFFENSIVE ODOURS (specifically including wastes with a pH below 6 or above 11);

Strong acids or caustic chemicals affect the biological processes used by the NWC to treat sewage. The presence of any of the materials listed under regulation (viii) clearly indicates that materials other than normal sewage have been discharged into the public sewer and their presence can cause septicity in NWC sewers - resulting in obnoxious smells - and can disrupt treatment.

So **NO ACIDS or STRONG CHEMICALS** in NWC sewers
PLEASE !



(ix) ALL WASTES of whatever kind WHICH CANNOT BE SATISFACTORILY PURIFIED BY THE NORMAL PROCESSES OF SEWAGE TREATMENT (which shall specifically INCLUDE NON-BIODEGRADABLE DETERGENTS OR ORGANICS GENERALLY, PESTICIDES AND HERBICIDES).

The first part of this paragraph re-emphasizes that **NO materials are to enter public sewers if they cannot be treated by the usual processes of treatment employed for normal domestic or residential sewage.**

It further identifies **non-biodegradable materials** (i.e. materials that cannot be decomposed by natural biological processes) **as a general prohibited category but specifically prohibits the discharge of non-biodegradable detergents, pesticides and herbicides.**

Detergents use various complex chemicals that help to reduce water hardness, provide alkalinity (which helps cleaning), help to keep dirt from redepositing on surfaces and to help whiten, brighten and remove stains. Fabric softening agents are used to impart softness and control static electricity in fabrics. Fluorescent whitening agents attach to fabrics to create whitening or brightening effects. The major components are usually **surfactants** - these enable the cleaner to wet a surface more quickly so dirt can be easily loosened and removed. Surfactants break up oily dirt and keeps it suspended in the wash water so it doesn't settle back on the surface being cleaned. Other major ingredients are **builders**. The most commonly used builders are inorganic compounds, including carbonate and phosphate compounds.

The chemicals used in some detergents readily break down into more simple compounds readily found in nature (that is they biodegrade) while those in other detergents do not. The chemicals in these later detergents therefore enter the environment directly and contribute to pollution. So please check the labels on the soaps, detergents and other cleaning products and use only those ones that clearly say "**BIODEGRADABLE**".

Many detergents also contain **Phosphate** (a compound of the non-metallic element phosphorous). Phosphate is a **nutrient supportive of growth in plants and certain other organisms. High levels of phosphates in water bodies promote the growth of certain algae, which, if allowed to grow excessively, can deplete the levels of oxygen in water to the point that fish and other aquatic life** (which also depend on the oxygen in the water to live) **may die.** Further excessive levels of nutrient in the sea (derived from raw or improperly treated sewage) will promote excessive seaweed growth – spoiling our bathing beaches and threatening our tourism industry. **So please check the labels on the soaps, detergents and other cleaning products and use only those ones that clearly say "NO PHOSPHATES" or "LOW PHOSPHATE".**

Naturally, as pesticides and herbicides are intended to kill living materials (pests and weeds) they can seriously affect the natural biological processes most commonly used today by the NWC to efficiently and cost effectively treat sewage. Further **many of the pesticides and herbicides used today in commercial farming activities in Jamaica can end up in our groundwater** if considerable care is not taken in their proper use (and in the disposal of their containers and residues) **and some are carcinogenic (i.e. potentially causing cancer in humans).**

Nitrate is another “nutrient” like phosphate and both of these are major components in most fertilizers - to provide nitrogen and phosphorous for plant growth. So do not dispose of any waste fertilizer down your sewers.

So.....PLEASE..... BE KIND TO THE ENVIRONMENT

DO NOT PUT

PESTICIDES,

WEEDKILLERS

or AGRICULTURAL CHEMICALS



drown the drain!



and ... PLEASE CHECK THE LABELS ON THE SOAPS, DETERGENTS AND OTHER CLEANING PRODUCTS THAT YOU BUY and **USE** those that are **BIODEGRADABLE** and have **NO PHOSPHATE** or are **LOW PHOSPHATE** !!!!!!!!

At paragraph 8 (d) the Consent to Discharge reminds the Owner/Occupier of the connected premises that the discharge of any of the prohibited wastes will make him/her liable for legal penalties for each and every day that such discharges occur – so please take the conditions under paragraphs 8 (a), (b) and (c) seriously as improper discharges could be costly!

Condition 10 requires the Owner/Occupier of any premises connected to an NWC sewer to promptly advise the NWC, in writing, of any change in ownership or occupancy of the property or of any change in use or any change of the circumstances of the property that could result in a change in the nature or composition of wastewater that will be discharged into the NWC's sewer.

This is to reinforce the requirements of Condition 4 – for the same reasons noted for that condition.

Condition 10 makes the Owner/Occupier of any premises connected to an NWC sewer responsible for paying “on demand” (that is, promptly) the NWC's bill for Sewage Service – and any other charges or penalties that may be properly levied on the customer.

Condition 11 reminds the Owner/Occupier that **any failure to pay all proper NWC charges gives the NWC the right to discontinue BOTH sewage and WATER SERVICES to the particular property involved** – and to recover any costs that the NWC may incur in disconnecting (and re-connecting) the premises – **with a deposit** of the estimated costs for restoration of service **to be paid** to the NWC **before any service is restored**.

THAT’S IT --- ANY QUESTIONS PLEASE CALL US!

As you can see the Consent to Discharge is a very necessary agreement that clearly sets out the responsibilities of the Owner / Occupier of any property connected to an NWC sewer – so that the NWC can do its part in providing its customers and the community at large with efficient and cost-effective sewage collection, treatment and treated sewage effluent disposal in a manner such that everyone may enjoy the benefits of a clean and healthy environment.

The NWC has invested many billions of dollars in modern sewage systems around Jamaica – and will continue to expand its sewage services throughout the island in the years to come.

Remember, NWC sewage systems do not generate waste they collect, treat and dispose of it properly.

Be careful of how you dispose of your waste and assist the NWC in its efforts to preserve our beautiful natural environment!



A message from your NWC sewage division

..... working to keep our sewers working and our environment clean !

Please remember - flush ONLY



and

what you have already eaten in your



Don't treat your toilet as a garbage disposal - otherwise either it or our sewers are likely to become clogged.

Just because a product is called disposable doesn't mean it should be flushed down the toilet.

Use the wastebasket in the bathroom for such things as facial tissues, gum, all sanitary products (wrap them in tissue first), condoms (wrap these also in tissue first and don't forget the packaging), bandages and paper towels.

Disposable diapers don't belong in a toilet - unless you first remove the plastic liner (dispose of this in the wastebasket) and tear the paper diaper into small pieces.

Flushing a facial tissue down a toilet is unlikely to cause a problem, but it helps to develop a bad habit that creates the impression that a toilet can digest everything. Plus, flushing a toilet to dispose of a facial tissue is a real waste of water.

Also remember that hazardous chemicals may not harm your toilet, but they shouldn't be flushed away either.

TOILET TRAINING FOR NWC SEWAGE CUSTOMERS

The simplest, single most important guideline, for toilet usage is that the only material to enter the toilet - other than human waste - is toilet paper. There simply should be no exception to the rule "toilet paper only".



BIN IT and then BAG IT



DON'T FLUSH IT

Provide an appropriate waste container in the bathroom or the restroom (both public and private) for **non-biodegradable** sanitary wastes and put them in your garbage. Do this for: -

- Facial tissues
- Sanitary napkins
- Tampons and tampon injectors
- Soiled disposable baby diapers
- Adult disposable diapers
- Baby wipes
- Used band aids, bandages and dressings
- Dental floss
- Condoms and their packaging
- Chewing gum and the wrappers



A message from your NWC sewage division

..... working to keep our sewers working and our environment clean !

SEWAGE & WASTEWATER - WHO DOES WHAT IN JAMAICA?



The **National Water Commission** is the agency of the Government of Jamaica charged with primary responsibility for the development and operation/maintenance of central **sewage** collection, treatment and treated effluent disposal systems throughout the island of Jamaica.[§] As such the Commission arranges for the funding of such systems, retains consulting engineers to design them, employs competent contractors to build them (under the close supervision of the consulting engineers and/or the NWC's own staff) and then takes full responsibility for their ongoing operation and long-term maintenance.

However in all these endeavours the NWC must also meet the requirements of a number of statutory agencies each responsible for overseeing different sectors of the public interest.

The **Environmental Health Unit (EHU)** of the **Ministry of Health** oversees the design and operation of public sewage systems to ensure the protection of Public Health and natural resources. The EHU is responsible for environmental health issues and provides technical advisory services to the Ministry of Health. The Environmental Health Unit is also responsible for developing guidelines for sewage and industrial effluent, and standards for air and water under the Public Health Act. It evaluates, advises and approves the disposal facilities for solid waste, hazardous materials, water and wastewater treatment for island wide development projects



To ensure the environment in and around Jamaica is protected and conserved for the common good, the **National Resource Conservation Authority** (now part of the **National Environment & Planning Agency**, an executive agency of the Government of Jamaica), under a mandate from the Government, **has established and enforces standards relating to the quality of any wastewater** (i.e. both sewage effluent and industrial effluent) **that may legally discharged to the environment in Jamaica.**

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- * Note that **"Sewage is used household or domestic water and water-carried solids"**. NWC sewage systems are not intended for the direct discharge of "industrial" wastewater. Subject however to proper pre-treatment (so that the quality of the wastewater approximates to that of domestic wastewater), the NWC may accept discharges from "industrial" customers into its sewage systems.
- * Other land developers in both the public and private sectors in Jamaica undertake the development of central sewage systems for their discrete developments but the design and construction of such sewage systems must comply with the requirements of the NWC (and of other statutory agencies) as, ultimately, responsibility for the ongoing operation and maintenance of all central sewage collection and treatment systems falls to the NWC.

